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Research Article

A survey of Gnaphosidae (Arachnida, Araneae) from Ascension Island with description of a new species of *Australoechemus* Schmidt & Piepho, 1994

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Abstract

An updated checklist of the gnaphosid spiders of Ascension Island – comprising five species, in five genera – is presented, based on examination of historical and new specimens from across Ascension, including its islet Boatswain Bird Island. The continued presence of the non-native *Marinarozelotes jaxartensis* (Kroneberg, 1875), *Urozelotes rusticus* (L. Koch, 1842), and *Zelotes laetus* (O. Pickard-Cambridge, 1872), previously recorded by prior workers, is confirmed. Two species are newly recorded from the island: *Synaphosus syntheticus* (Chamberlin, 1924) from the mainland and *Australoechemus vickyae* **sp. nov.** (♂♀) from both Boatswain Bird Island and the mainland.

Key words: Aranei, distribution, gnaphosid, inventory, new species, taxonomy, United Kingdom Overseas Territories

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Introduction

Ascension Island is a remote volcanic island in the South Atlantic Ocean, part of the United Kingdom Overseas Territory of Saint Helena, Ascension and Tristan da Cunha. The invertebrate biodiversity of the island is understudied, especially the spider fauna which has hitherto only received general faunistic attention in three prior works (Duffey 1964; Ashmole and Ashmole 1997, 2000). The family Gnaphosidae Banks, 1892, commonly known as ground spiders, currently contains 150 genera and 2458 species (WSC 2023) of which only a handful have been recorded from the island, either at species or generic level (Duffey 1964; Ashmole and Ashmole 1997, 2000).

Recently, the senior author has been sorting the collection of spiders made by E. A. Duffey from Ascension Island (Duffey 1964), an expedition which also included one of the other authors (Philip Ashmole); also sorting newly collected

specimens sent by author Adam Sharp. This has revealed a total of five species of gnaphosid, three previously known from the island (sometimes under names which are now considered as junior synonyms) and two new for Ascension Island. Of these newly recorded morphospecies, one corresponds to *Synaphosus syntheticus* (Chamberlin, 1924) and the other is an undescribed species of *Australoechemus* Schmidt & Piepho, 1994.

In this work, we provide an updated list of the gnaphosid spiders of Ascension based on examined specimens, also providing complimentary photographs of the genitalia of *S. syntheticus* and describing *Australoechemus vickyae* sp. nov. from both sexes.

Materials and methods

Images of specimens were made using a Canon EOS 6D Mark II attached to a Leica MZ12.5 stereomicroscope, with images stacked using Helicon Focus software. Abbreviations: **Ah** = anterior hood; **Al** = tegular anteroprolateral membranous lamellar extension; **ASC** = Ascension Island Conservation Directorate collection, Georgetown, Ascension Island (it is intended in the future that the ASC invertebrate collection will be donated and moved to the Saint Helena National Trust, Jamestown, Saint Helena); **Bc** = bursa copulatrix; **Co** = conductor; **Em** = embolus; **Fe** = femur; **MMUE** = Manchester Museum, Manchester, United Kingdom; **Mt** = metatarsus; **NHMUK** = Natural History Museum, London, United Kingdom; **OUMNH** = Oxford University Museum of Natural History, Oxford, United Kingdom; **Pa** = patella; **Re** = receptacles; **Sd** = sperm duct; **St** = subtegulum; **Ta** = tarsus; **Ti** = tibia; **WSC** = World Spider Catalog. Setation: d = dorsal, p = prolateral, r = retrolateral, v = ventral, macrosetae are scored in posterior, median and anterior thirds (e.g. 1–2–3). Total lengths include chelicerae but exclude spinnerets. Leg measurements are presented as: total length (femur, patella, tibia, metatarsus, tarsus). All measurements in mm. References are provided for most relevant publications dealing with taxonomy of the species. Authors' emphases in [ ].

Results

Australoechemus Schmidt & Piepho, 1994

Australoechemus Schmidt & Piepho in Schmidt et al. 1994: 101.

Type species. *Australoechemus oecobiophilus* Schmidt & Piepho, 1994 by original designation.

Diagnosis (tentative, based on species known from adults but not the type species, known only from an immature holotype). Murphy (2007: 13) placed *Australoechemus* into the *Drassodes* Group; genera of this informal grouping were defined based on to their relatively large size, "plain, tawny-light, light greyish abdomen, occasionally patterned", presence of a notch at the apex of the trochanters, and absence of a dorsal scutum in the male. At the generic level, *Australoechemus* (*sensu* Murphy, 2007) differs from other gnaphosids by the male palp with a U-shaped sperm duct not meandering, running along margins of the tegulum (vs. meandering, or not located on the margin of the tegulum in other presently known genera) and the presence of a tegular an-

teroprolateral membranous lamellar extension (*Al*) (*Al* absent in other presently known genera).

Remarks. This genus was described to accommodate two new species from the Cape Verde Islands: *A. oecobiophilus* Schmidt & Piepho, 1994 and *A. celer* Schmidt & Piepho, 1994. *Australoechemus oecobiophilus* was chosen as the type species although its holotype is a juvenile specimen. The diagnosis and illustrations given in the paper are very poor, for instance the generic diagnosis comprises solely the following short and vague sentence: "Von *Echemus* Simon, 1878 durch das Fehlen eines Putzkammes an Metatarsus III und IV unterschieden. Die Gattung scheint *Xerophaeus* Purcell, 1907 nahezustehen" ["Distinguished from *Echemus* Simon, 1878 by the absence of preening combs on metatarsi III and IV. The genus appears to be close to *Xerophaeus* Purcell, 1907"] (Schmidt et al. 1994: 101). A detailed illustrated redescription is given for *A. celer* by Murphy (2007), and it is on this greatly improved work that we decide to place *A. vickyae* sp. nov. in this genus, given general similarities in the overall structure of the male palp and female epigyne. It is essential that future workers clarify the taxonomy of the type species *A. oecobiophilus* based on adult specimens. This is outside the scope of the present work.

***Australoechemus vickyae* sp. nov.**

https://zoobank.org/66935B7B-7C32-4276-9A5B-1707D8DA4ACC

Figs 1–4

Material examined. ***Holotype*:** Ascension Island • 1♂; Boatswain Bird Island; -7.936, -14.307; 12–31.IX.1957; E. Duffey leg.; No. 91; NHMUK.

***Paratypes*:** Ascension Island • 1♀; Boatswain Bird Island; -7.936, -14.307; 12–31.IX.1957; E. Duffey leg.; [no number]; NHMUK • 1♀; Boatswain Bird Island; -7.936, -14.307; 12–31.IX.1957; E. Duffey leg.; No. 35; NHMUK • 1♀; Boatswain Bird Island; -7.936, -14.307; 12–31.IX.1957; E. Duffey leg.; No. 51; NHMUK • 1♂, 1 immature ♂; Boatswain Bird Island; -7.936, -14.307; 12–31.IX.1957; E. Duffey leg.; No. 65; NHMUK • 1♀; Boatswain Bird Island; -7.936, -14.307; 26–27.V.1995; P. Ashmole and M. Ashmole leg.; ?*Nodocion* sp. det. J. A. Murphy; Murphy collection No. 23865; MMUE G7572.13477 • 1♀; South Gannet Hill, Ascension Island; -7.983, -14.399; 15.V.2013; pitfall trap; L. F. White leg.; ASC01604 • 1♀; near English Bay Road, Ascension Island; -7.913981, -14.378077; 85 m.a.s.l; pitfall trap; 13/01/2022; A. Sharp leg.; ASC F13 2 PFJ.

Diagnosis. *Australoechemus vickyae* sp. nov. somewhat resembles *A. celer*, but males can be distinguished by having the retrolateral tibial apophysis almost as long as tibia, tapering at the tip and non-bifurcated (vs. shorter than tibia, broad at tip and bifurcated). Females of *A. vickyae* sp. nov. differ from those of *A. celer* by having the epigynal fovea widest in anterior part (vs. wider in midpart) and having receptacles smaller than the bursa copulatrix (vs. receptacles larger than bursa copulatrix).

Etymology. The specific epithet is a matronym in honour of British conservationist and entomologist Vicky Wilkins (Species Recovery Trust, Salisbury, UK, and co-chair of the IUCN SSC Mid-Atlantic Islands Invertebrate Specialist Group) for her enduring and significant contributions to the conservation of invertebrates in the United Kingdom Overseas Territories.

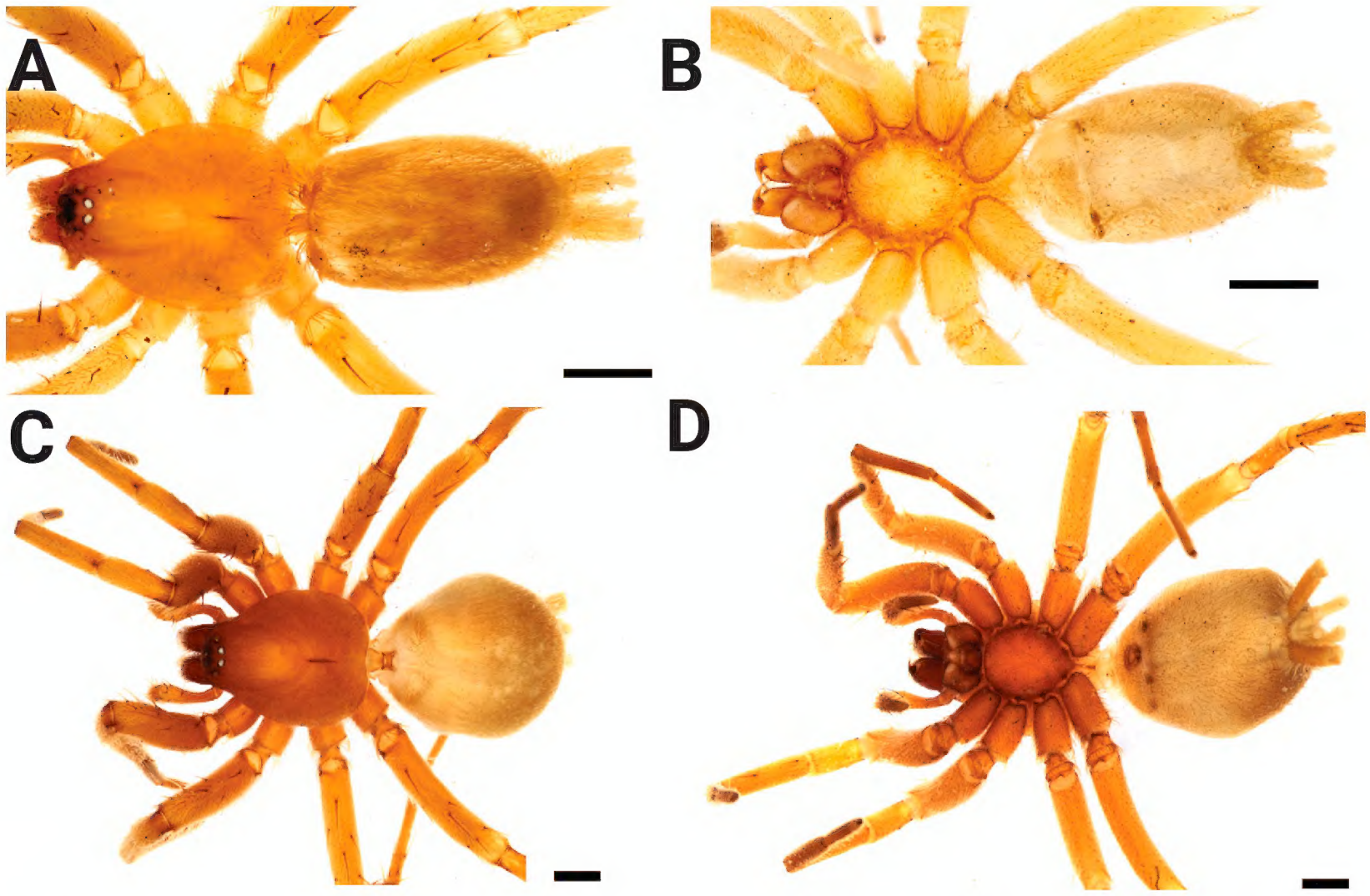

Figure 1. Habitus of *Australoechemus vickyae* sp. nov. **A** holotype male, dorsal **B** ibid, ventral **C** paratype female, dorsal **D** ibid, ventral. Scale bars: 1 mm.

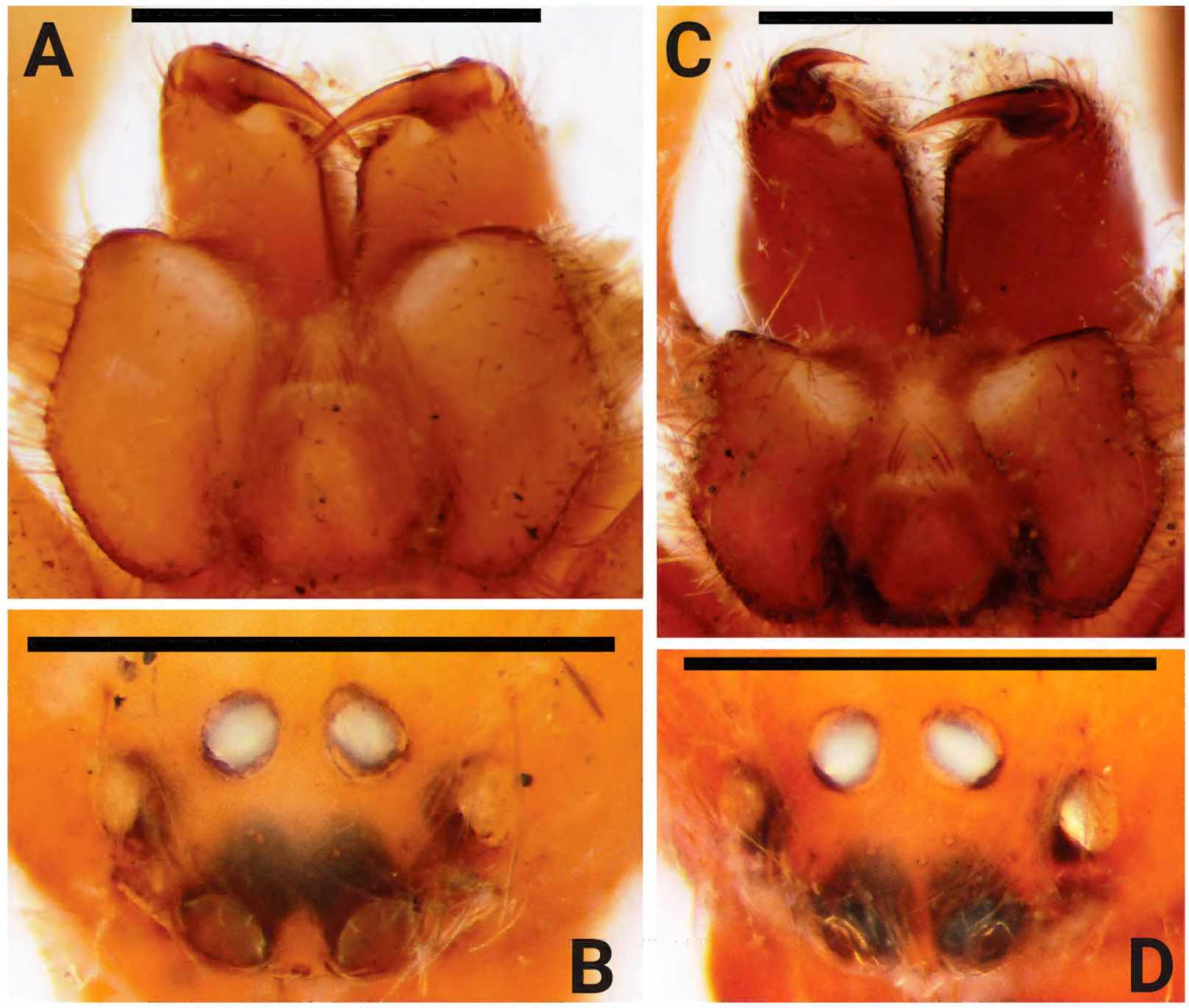

Figure 2. Ventral face of chelicera and eye pattern of *Australoechemus vickyae* sp. nov. **A** holotype male, chelicera **B** holotype male, eye pattern **C** paratype female, chelicera **D** paratype female, eye pattern. Scale bars: 1 mm.

Description. Male (holotype). ***Total length*:** 6.17. Carapace: 2.67 long, 2.12 wide. ***Abdomen*:** 2.89 long, 1.75 wide. ***Leg measurements*:** I 8.12 (2.28, 1.05, 2.02, 1.63, 1.14), II 8.00 (2.28, 1.03, 1.44, 1.93, 1.32), III 7.49 (2.21, 0.87, 1.24, 1.85, 1.32), IV 11.02 (2.36, 1.56, 2.39, 3.28, 1.43). ***Setation*:** for legs see Table 1. ***Colour*** (in alcohol): overall light brown, abdomen slightly darker than carapace, chelicerae and legs (Fig. 1A, B). Chelicera with three promarginal teeth and one retromarginal tooth (Fig. 2A). ***Eyes*:** AME largest, PME not reduced in size (Fig. 2B).

Palp (Figs 3A, 4A–D).

Patella longer than tibia, about 2× longer than wide; tibia about 2× longer than wide with non-bifurcated retrolateral apophysis gradually tapering toward tip, tip slightly bent prolaterally; cymbium elongate, gradually tapering, 2.2× longer than wide; bulb oval, 1.8× longer than wide, with very long subtegulum (*St*); sperm duct (*Sd*) U-shaped, retrolaterally as wide as tibial apophysis, gradually tapering prolaterally; anteroprolateral part of tegulum with elongate tegular anteroprolateral membranous lamellar extension (*Al*); conductor (*Co*) small, membranous, located near tip of embolus; embolus (*Em*) originates at about 9 o'clock position, straight, tip slightly bent. ***Palpal setation*:** femur d 0–1–4 r0–1–0 p0–1–0; patella d0–0–1; tibia d1–1–0.

Female (paratype). ***Total length*:** 8.27. ***Carapace*:** 3.53 long, 2.62 wide. ***Abdomen*:** 3.67 long, 2.63 wide. ***Leg measurements*:** I 8.96 (2.02, 1.63, 1.87, 1.98, 1.46), II 8.79 (2.01, 1.65, 1.72, 1.96, 1.45), III 8.29 (1.17, 1.38, 2.19, 2.00, 1.55), IV 11.42 (3.03, 1.82, 2.66, 2.57, 1.34). ***Setation*:** for legs see Table 2, palp: femur d0–1–2 r0–1–0 p0–1–0; patella p0–1–0 r0–1–0; tibia d1–1–1 p0–2–1; tarsus d2–0–0 p2–1–0. Colour (in alcohol): carapace and legs light brown, abdomen beige, chelicerae reddish-brown (Figs 1C, D, 2C). Chelicera with three promarginal teeth and one retromarginal tooth (Fig. 2C). ***Eyes*:** AME largest, PME not reduced in size (Fig. 2D).

Epigyne. Epigynal plate almost as long as wide, with large fovea and distinct anterior hood (*Ah*); fovea widest anteriorly, posterior part 2× thinner than anterior; bursa copulatrix (*Bc*) oval, longer than wide, spaced by about ½ of length; receptacles (*Re*) oval, transversal, locate at posterior margin of endogyne, spaced by about one width (Fig. 3B, C).

Table 1. Leg setation.

	Fe	Pa	Ti	Mt
I	d1–1–1 r0–1–0 p0–0–2	–	v1–2–2	v 2–0–0
II	d1–1–1 r0–1–1 p0–1–1	–	v0–0–2	–
III	d1–1–1 r0–1–1 p0–1–1	–	d1–2–3 v3–2–2	v 2–1–3
IV	d1–1–1 r0–1–1 p0–1–1	–	d1–2–1 v2–2–2	d2–4–3 v2–4–5

Table 2. Leg setation.

	Fe	Pa	Ti	Mt	Ta
I	d1–1–1 r0–1–0 p0–0–2	–	v1–1–1	v2–0–0	–
II	d1–1–1 r0–1–0 p0–2–1	–	v1–1–1	v2–0–0	–
III	d1–1–1 r0–1–1 p0–1–1	r0–1–0	d1–2–2 v2–2–3	d0–2–2 v2–1–2	–
IV	d1–1–1 r0–1–1 p0–1–1	r0–1–0	d2–2–3 v2–2–2	d2–3–2 v2–4–3	–

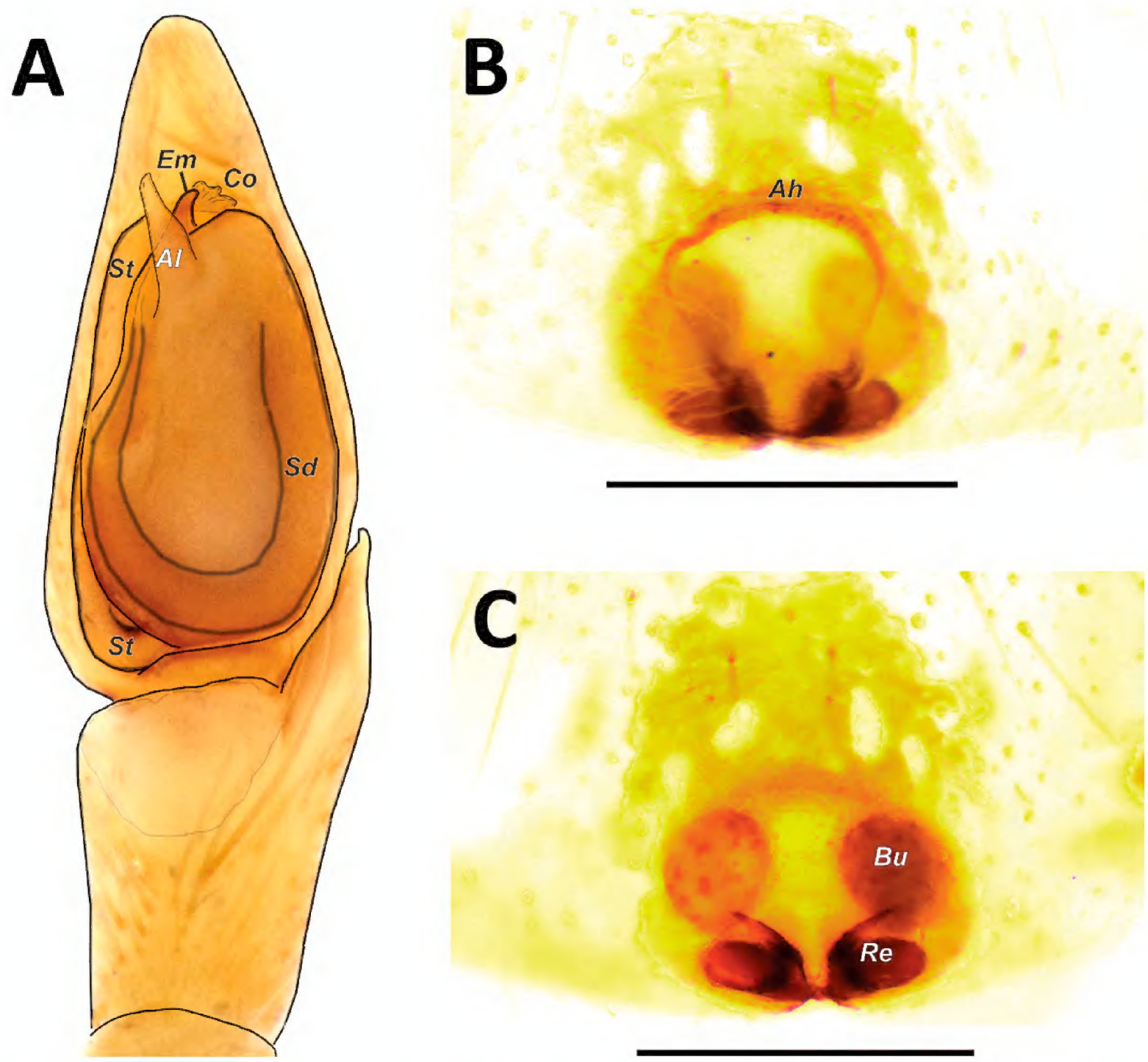

Figure 3. Copulatory organs of *Australoechemus vickyae* sp. nov. **A** holotype male palp, ventral, structures traced **B** paratype female epigyne (cleared), ventral **C** ibid, endogyne (cleared), dorsal. Abbreviations: *Ah* = anterior hood, *Al* = tegular anteroprolateral membranous lamellar extension, *Bu* = bursa copulatrix, *Co* = conductor, *Em* = embolus, *Re* = receptacle, *Sd* = sperm duct, *St* = subtegulum. Scale bars: 0.5 mm (**B, C**).

Total length variation. 6.17–7.37 (adult males, n=2); 8.25–9.24 (adult females; n=6).

Distribution. Known only from Ascension Island, South Atlantic Ocean.

Remarks. The holotype and most of the paratypes were collected from Boatswain Bird Island, an islet which hosts several unique endemic arachnids (Ashmole and Ashmole 2000). The paratype used for description is the unnumbered female in the Duffey collection, and it has also been clearly marked as the female used in the description on a newly added type label by DS. Two paratype females were collected recently on the mainland, indicating this species occurs more widely on Ascension. Eric Duffey was a prolific collector who collected all over the main island and Boatswain Bird Island (Stonehouse 1960; PA pers. obs.). Fortunately, the type specimens of *A. vickyae* sp. nov. collected by Duffey were explicitly collected by him only from Boatswain Bird Island (as "*Drassodes* spp." in Duffey 1964) enabling us to be sure of their collecting locality. This species represents an interesting new record of a genus only thought to occur in the Cape Verde Islands previously (WSC 2023). Molecular work in the future could further elucidate the higher-level relationships of this genus to other gnaphosids. Nonetheless, the morphology of the new species clearly favours placement in

Figure 4. General views of palp of holotype of *Australoechemus vickyae* sp. nov. **A** ventral **B** retrolateral **C** prolateral **D** dorsal. Scale bars: 1 mm.

Australoechemus under its current definitions for the following reasons: (1) the similar shape of the tegular anteroprolateral membranous lamellar extension, the shape of the cymbium, the U-shaped sperm duct, and the absence of a scutum in the male, (2) the epigyne with a large fovea and distinct anterior hood in the female and (3) the presence of a trochanteral notch in both sexes.

***Marinarozelotes jaxartensis* (Kroneberg, 1875)**

Trachyzelotes jaxartensis: Levy 1998: 107, figs 25–28 (♂♀).
Marinarozelotes jaxartensis: Ponomarev and Shmatko 2020: 135, figs 7–8, 11, 30, 37–38, 50, 59 (♂♀).

Other citations. For complete list of taxonomic references, see WSC (2023).

Material examined. Ascension Island • 1♀; Packers Hole Cueva [Cave]; -7.923, -14.368; 13–17.III.1990; P. Ashmole and M. Ashmole leg.; ASC 0173 • 1♀; South Gannet Pools; -7.9865, -14.4015; 24.III.1990; P. Ashmole and M. Ashmole leg.; ASC 0259 • 1 immature; Letterbox [Peninsula]; -7.947, -14.297; 18–22 March 1990; P. Ashmole and M. Ashmole leg.; ASC 0745 • 1♀; Scouts Path [Green Mountain National Park]; -7.944, -14.346; 28.I.2020; [no collector stated]; ASC • 1♂; South Gannet Upper; -7.983, -14.399; 23–27 March 1990; P. Ashmole and M. Ashmole leg.; ASC 0592 • 1♀ Ascension Island; -7.94, -14.37; August–November 1957; E. A. Duffey leg.; No. 25; NHMUK.

Remarks. Invasive. Originally described from Central Asia, but now known to also occur across the Holarctic, and in Hawaii, India, Mexico, and South Africa (WSC 2023). First recorded from Ascension Island as *Camillina acanthognathus* (Purcell, 1907) by Duffey (1964). Specimens collected in the 1990s by Philip and Myrtle Ashmole (University of Edinburgh) indicate it is still found on the island.

***Synaphosus syntheticus* (Chamberlin, 1924)**

Fig. 5

Synaphosus syntheticus: Ovtsharenko et al. 1994: 5, figs 1–2, 12–20 (♂♀).
Synaphosus syntheticus: Zamani et al. 2023: 355, figs 7A, 8D (♀, habitus and epigyne).

Other citations. For a complete list of taxonomic references, see WSC (2023).

Material examined. Ascension Island • 1♀ Travellers Hill; -7.94, -14.37; pitfall trap baited with fish; 11th March 2022; A. Sharp leg.; ASC G16 1 PFF • 1♂ same data as preceding but baited with meat; ASC G16 1 PFM.

Remarks. Invasive. Newly recorded for Ascension. *Synaphosus syntheticus* was initially described in *Nodocion* Chamberlin, 1922 and is often sympatric with *Nodocion s.s.* in the Nearctic. This species is also found in Africa (Egypt, Libya), the Middle East (Israel and Saudi Arabia) and is thought introduced to the United States and Mexico, although it was originally described from California (Ovtsharenko et al. 1994; WSC 2023). We provide complimentary images of the palp (Fig. 5A, B) and epigyne (Fig. 5C, D).

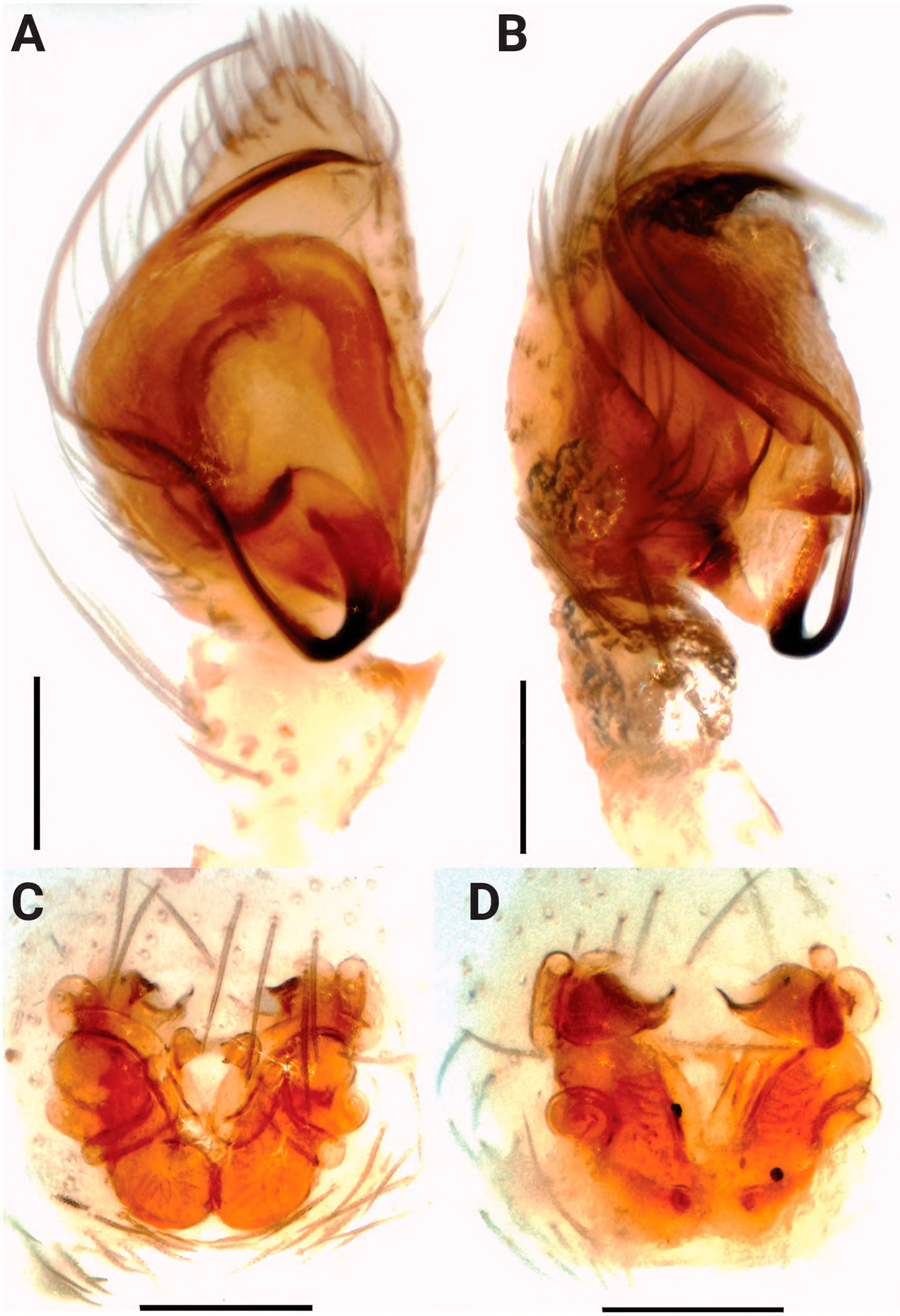

Figure 5. Copulatory organs of *Synaphosus syntheticus* Chamberlin, 1922 specimens from Ascension **A** male palp, ventral **B** Ibid, prolateral **C** epigyne (cleared), ventral **D** endogyne (cleared), dorsal. Scale bars: 0.1 mm.

***Urozelotes rusticus* (L. Koch, 1842)**

Urozelotes rusticus: Platnick and Murphy 1984: 24, figs 55–58 (♂♀).
Zelotes rusticus: Grimm 1985: 221, figs 217b, 218b, 244, 272–273 (♂♀).

Other citations. For complete list of taxonomic references, see WSC (2023).

Material examined. Ascension Island • 1♀ Lady Hill; -7.95, -14.37; pitfall trap baited with meat; 3rd March 2022; A. Sharp leg.; ASC F17 3 PFM • 1♂ Cricket Valley; -7.95, -14.34; pitfall trap; 24th March 2022; A. Sharp leg.; ASC K17 3 PFU • 1♀ North of Cocoanut Bay; -7.97, -14.34; pitfall trap baited with jam; 14th January 2022; A. Sharp leg.; ASC K19 3 PFJ • 1♂ Lower Valley Crater; -7.92, -14.34; subterranean pipe trap baited with blue cheese; 29th March 2023; A Sharp leg.; ASC LVC PTC • 1♂, 1♀; Boatswain Bird Island; -7.936, -14.307; hand collected; P. Ashmole and M. Ashmole leg.; ASC 1161 • 1♂ Ascension Island; -7.94, -14.37; collected between August-November 1957; E. A. Duffey leg.; No. 25; NHMUK.

Remarks. Invasive. Originally described from Tirol in Central Europe, but now known from all continents (WSC 2023). First recorded from Ascension Island by Duffey (1964) as *Zelotes rusticus*. Recent specimens confirm it is still to be found on the main island.

***Zelotes laetus* (O. Pickard-Cambridge, 1872)**

Zelotes laetus: Levy 1998: 122, figs 58–61 (♂♀).

Other citations. For complete list of taxonomic references, see WSC (2023).

Material examined. Ascension Island • 1♂, 1♀; South Gannet Pools; -7.9865, -14.4015; 23–27 March 1990; Lava; P. Ashmole and M. Ashmole leg.; ASC 0830 • 1♂ Perfect Crater; -7.92, -14.36; pitfall trap baited with meat; 27th January 2022; A. Sharp leg. ASC H14 3 PFM • 1♂ Georgetown; -7.93, -14.41; pitfall trap baited with fish; 4th February 2022; A. Sharp leg.; ASC B15 2 PFF • 1♂ Dark Crater; -7.96, -14.39; pitfall trap; 15th February 2022; A. Sharp leg.; ASC E19 1 PFU • 1 imm. Ascension Island; -7.97, -14.39; 15.II.2022; superficial deposits; collected by hand; A. Sharp leg.; ASC E19 2 HC • 1 imm. Ascension Island; -7.93, -14.41; 04.II.2022; Intermediate Zr/Nb mafic flows (Younger flows); collected via litter extraction; A. Sharp leg.; ASC B15 1 LC • 1 imm. ♀, 1 imm.; Ascension Island; -7.96, -14.38; Low Zr/Nb mafic flows; collected by hand; A. Sharp leg.; ASC E19 3 HC • 1♂; North East Bay; -7.919, -14.344; 29.I.2013; pitfall trap; L. F. White leg.; ASC01117 • 1♂; same data as preceding except 28.II.2013; ASC01197 • 1♀; same data as preceding except 26.III.2013; ASC01354 • 1♂; same data preceding; ASC01376 • 1 imm.; same data as preceding except 21.V.2013; ASC01683 • 1 imm.; same data as preceding except 23.IV.2023; ASC01527 • 1♂; same data as preceding except 06.XII.2012; ASC00867 • 1♂ Ascension Island; -7.94, -14.37; collected between August-November 1957; E. A. Duffey leg.; No. 11; NHMUK.

Remarks. Invasive. Originally described by Pickard-Cambridge (1872) from 'Palestine' (modern Israel), known from West Palaearctic, introduced to Hawaii, USA, Mexico, and Peru (WSC 2023). First recorded on Ascension Island by Ashmole and Ashmole (1997) under the junior synonym *Zelotes inauratus* O. Pickard-Cambridge, 1872 (types in OUMNH examined by DS) although a male

was also found in the Duffey collection at NHMUK. Recently collected specimens confirm its continued presence on the main island.

Discussion

The gnaphosid fauna of Ascension Island, like most spider families present, is depauperate. Nonetheless, since records of some taxa given by Duffey (1964) had no precise locality, the study of more recent specimens from the 1990s and twenty first century allows us to provide the first precise locality records for some species on the island. Of note, Duffey (1964) also recorded *Gnaphosa funerea* (Dalmas, 1921) [using its original name, which is a homonym, *Pterochroa lugubris* O. Pickard-Cambridge, 1873] from Ascension Island but all of the relevant specimens labelled as this species in the Natural History Museum, London are immature gnaphosids of indeterminate genus (DS pers. obs.) and therefore *G. funerea* is hereby removed from the list of Ascension Island's spiders, as it cannot be confirmed from indeterminate juvenile specimens.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

DS identified the specimens, produced plates, made diagnoses and descriptions, wrote the first draft of the manuscript and edited the revised maniscript. YMM identified specimens, produced plates, and edited the revised manuscript. AS collected specimens, provided locality and ecological data and edited the revised manuscript. PA collected specimens and provided locality and ecological data and edited the revised manuscript.

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Data availability

All of the data that support the findings of this study are available in the main text.

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